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A Within-Host Modeling Framework For SARS-CoV-2 Infection to Support Vaccine Strategies

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A Within-Host Modeling Framework For SARS-CoV-2 Infection to Support Vaccine Strategies, Jeffry Schroeter[1], Rachel Jennings[1], Morgan Rose[1], Jonathan Rolfs[1], and Angela Reynolds[2]

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COVID-19 initially develops as a respiratory infection but may progress systemically. Vaccines have garnered much attention due to their rapid development in response to the COVID-19 pandemic and their dramatic success in reducing viral spread. Here, we introduce a mathematical model to study mucosal and systemic immunity conferred by intramuscular and intranasal vaccines following exposure to SARS-CoV-2. The model delineates between viral kinetics in the upper and lower respiratory tracts as well the differentiates between the immunological responses activated at each site. Numerical simulations were performed in an effort to assess optimal vaccination strategies, which may include a combination of intranasal and intramuscular vaccines to elicit a sufficient combined mucosal and systemic immune response.